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CERTIFICATE

This certificate is issued in support of an application for Patent registration in a country outside New Zealand pursuant to the Patents Act 1953 and the Regulations thereunder.

I hereby certify that annexed is a true copy of the Provisional Specification as filed on 18 March 2003 with an application for Letters Patent number 524783 made by HOT WATER WEED CONTROL LIMITED.

I further certify that pursuant to a claim under Section 24(1) of the Patents Act 1953, a direction was given that the application proceeds in the name of GREEN WEEDER HOLDINGS LIMITED.

Dated 31 March 2004.



Neville Harris
Commissioner of Patents, Trade Marks and Designs



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524783

Patents Form # 4

NEW ZEALAND

Patents Act 1953

PROVISIONAL SPECIFICATION

Title: Fluid Heater

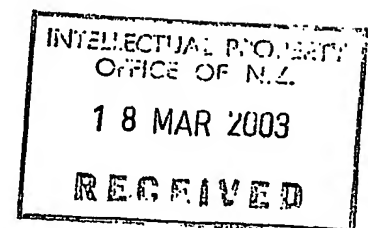
We, ***HOT WATER WEED CONTROL LIMITED,***

Nationality: *A citizen/company*

Address: *16 Byron Avenue, Takapuna, Auckland, New Zealand,*

do hereby declare this invention to be described in the following statement :

- 1 -



FLUID HEATER

FIELD OF THE INVENTION

The invention relates to a portable fluid heater for electrically heating fluid near to boiling point in a continuous stream.

5 BACKGROUND

A requirement exists for supplying a continuous source of near boiling water in a portable form for use in for killing weeds or ant nests, for heating the skin of dead animals so that feathers or hair can be stripped, for wallpaper stripping or for similar purposes. The apparatus required to do this must avoid some non-obvious problems. Among these are the need for the apparatus not
10 to be orientation sensitive, not to fail disastrously if the supply of water is interrupted, not to react to air embolisms in the water supply and to work regardless of the water input temperature.

PRIOR ART

15 Electrically powered portable continuous supply fluid heaters are known :

US Patent 2 287 974 describes a continuous hand held water heater, however it has no temperature control other than manual flow control and would appear to be sensitive to air bubbles.

US Patent 2 976 392 describes a spray gun which heats the sprayed fluids, however the only
20 temperature control appears to be by manual flow control.

US Patent 3 718 805 describes a portable water heater, however the output is steam and there is no temperature control other than manual flow control.

US Patent 4 026 025 describes a dental syringe with heating of the fluid flow, however the only temperature control is by manual flow control.

- 5 Additionally other attempts have been made to control the output temperature by electronically controlling the electrical input to the heater dependent on the output temperature, however it is difficult to cope with air bubbles and varying water pressures and input water temperatures in this way since the range of possible flows is too great.

- 10 None of these heaters are capable of supplying water at a temperature approaching boiling point and maintaining the temperature at or near that point regardless of flow or water temperature changes.

OBJECT

- 15 It is an object of this invention to provide a water heater which is capable of providing water consistently near boiling point, which does not have a strong likelihood of self destructing in imperfect conditions, and which will at least provide the public with a useful choice.

STATEMENT OF INVENTION

.The invention relates to a fluid heater consisting of :

a continuous fluid supply

- 20 an electrical heater with at least one heating element for said fluid, said heater being over-temperature limited but being otherwise uncontrolled

a flow controlling valve located in the fluid flow path after the heating element which valve provides a controlled through flow which through flow increases as the fluid approaches the desired output temperature but which through flow is never zero.

Preferably the electrical heater is in a heat conducting block which surrounds a fluid passage, the fluid passage being sized to prevent the formation of static bubbles even at low flow levels.

Preferably the heat conducting block is an extrusion of aluminium.

Preferably the heating elements are retained within holes in the heat conducting block.

- 5 Preferably the thermal inertia of the heat conducting block is sufficient that should the fluid flow cease an over-temperature cutout will act before the fluid boils and any subsequent temperature rise will be insufficient to cause boiling.

- 10 Preferably the flow controlling valve is rendered temperature sensitive by containing at least some of a fluid with a boiling point the same as the fluid being heated, the vapour pressure of the first fluid acting to increase the fluid flow as the temperature approaches boiling point.

Preferably the heat input from the heater does not cause the water temperature to exceed boiling point at the maximum available flow conditions.

Preferably the flow controlling valve first fluid is encapsulated in a bellows or in a sealed cavity with one movable wall.

- 15 Preferably the entire fluid path within the heater is of a size such that under all but the most minimal flow conditions static bubbles cannot form.

Preferably under such minimum flow conditions a pressure valve is provided to disconnect the heater.

DRAWINGS

- 20 Figure 1 Is a cross-sectioned perspective view of the water heater as a weed killer

PREFERRED EMBODIMENTS

Figure 1 shows a weed killer 11 with a water flow path from hose inlet 12 through electric heater 13 and flow controlling valve 14 to outlet 15. Electric heater controlling switch 16 activates the heater, through which the water passes in a thin film, thus preventing the formation of static bubbles. The heater preferably has an over temperature cutout 17 which is set slightly above boiling point, and a pressure switch 18 which does not operate to switch on the heater until some water pressure is present.

The water flow path from the heater is restricted both by flow regulating valve 14 and by the small bore of the water pipe itself. The former varies in accordance with the temperature reached while the latter acts to set an upper limit on the amount of flow which can be achieved, thus preventing extreme flows in fault conditions.

The flow regulating valve is of known type and is biased so that it can never be completely closed, which ensures that when the heater is connected to a water supply there will always be a flow. As the water flow heats up valve 14 opens further, the rate of increase in opening itself increasing as boiling point of the first fluid in the valve is approached. The energy of the electric heating element is set so that at the highest water input temperature likely to be reached, with the lowest water pressure allowed by the water pressure switch, and with the valve at operating temperature the water temperature does not increase sensibly above boiling point. Where the input water temperature is at its lowest and the water pressure is at its highest the valve will not be open as far so the water flow will be less and the output temperature will be sensibly the same.

Large air bubbles in the water supply may completely occupy the water flow passages within the heater, but since heat transfer to air is better than that to water, and since the viscosity of air is much less than that of water the effect is merely to provide a blast of air at close 100°C. A small amount of steam may be present in these circumstances but no superheated steam will be generated.

ADVANTAGES OF THE PREFERRED EMBODIMENT

The water heater described provides automatic control of water output temperature at a temperature close to boiling point without undue variation from water input temperature, water pressure or supply voltage. It accomplishes this by varying the output flow in proportion to the output temperature.

- 5 It is not susceptible to water supply interruption, or to orientation of the heater.

VARIATIONS

A reverse flow prevention valve may be located at the water supply input to prevent the possibility of hot water returning through the input.

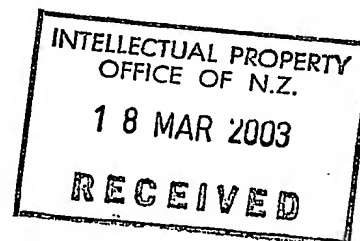
- 10 Since the output flow is proportional to the input power it is possible to increase the flow by increasing the input power, typically by using more than one electric heater in series or by increasing the circumference of the water film within the heater and using higher wattage heater elements.

- 15 The flow control valve may close completely once the water supply is disconnected, thus preventing dripping and ensuring that the system is full of liquid. Any water pressure in the input should open the valve at least slightly. This ensures that if fault conditions raise the pressure at the input then the output valve will be open.

PIPERS

P.H.G.
Attorneys for the applicants

- 20 **Hot Water Weed Control Limited**



ABSTRACT

A continuous flow water heater capable of supplying water at close to boiling point has an electric water heating element located prior to a flow regulating valve which increases flow as the water temperature rises to provide a stable temperature. As boiling point is reached the
5 valve rapidly increases its opening but the valve never entirely closes.

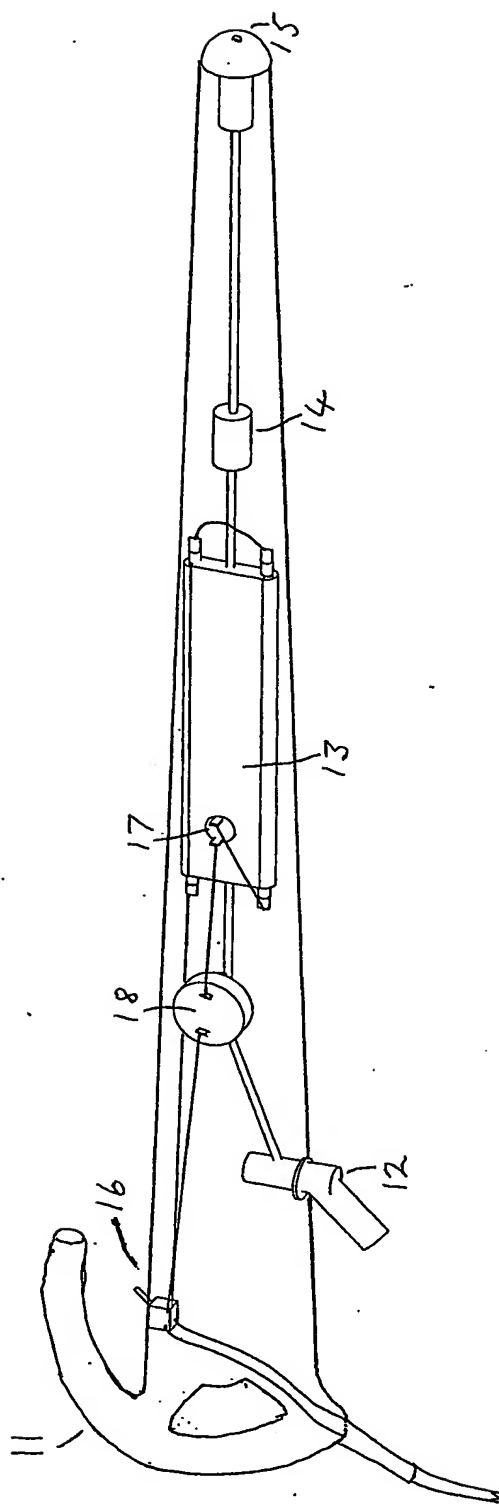


Figure 1

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